REMARKS

This application has been carefully reviewed in light of the Examiner's action dated July 22, 2004. Claims 1-5, 17, 18 and 23-27 have been amended. Reconsideration and full allowance are respectfully requested.

The Examiner rejected claims 1-42 under 35 U.S.C. §112 first paragraph for reasons not addressed to patentability of the subject matter addressed thereby. Specifically, the Examiner asserts, "In the claims, a microphone (106, 404) not only receives acoustic input, but also receives an electrical input, which was not described in the specification how such a task has been done." Applicant respectfully submits that none of the noted claims 1-42 requires that a microphone receive an electrical input. Rather, these claims variously entail the receipt of an acoustic sound (an acoustic feedback sound) received over a feedback path (e.g., feedback path 104 as shown in Figs. 1 and 4). This acoustic feedback sound is generated in conjunction with the actuation of an implanted transducer in response to test signals (drive signals) received by the transducer. Page 3, lines 15-20. That is, operation of the transducer results in an audible sound or "feedback" that may be generated by and/or carried over one or more components of the auditory system (feedback path) and then be detected by the microphone. Page 4, lines 5-8. More specifically:

> The feedback path 104 usually includes the bones and/or other parts of the skull, or the eardrum coupled with the air in the ear canal. The feedback over the path 104 is often detectable by the microphone 106, thereby causing a feedback frequency response by the microphone. Page 10, lines 17-21.

In all cases, the outputs of the microphone are representative of the frequency response of the microphone to an acoustic input. Page 11, lines 18-22. Accordingly, Applicant respectfully submits that claims 1-42 as presented are fully supported in accordance with Section 112 and are presented in condition to render the rejection under 35 U.S.C. §112 moot. It is believed that this rejection has been overcome.

Claims 1-10, 14-26 and 34 were rejected under 35 U.S.C. §102(b) as being anticipated by U.S. Patent No. 6,554,762 to Leysieffer. As set forth below, all the claims are believed to be

allowable as presented and therefore, this rejection is respectfully traversed. The noted claims include independent claims 1, 15 and 23.

As presented, independent claim 1 is directed to a hearing aid that allows for monitoring the operational characteristics of a microphone associated with the hearing aid. The hearing aid includes a transducer implantable within a patient to stimulate a component of an auditory system and a microphone operative to process acoustic sounds and to generate frequency responses representative of those acoustic sounds. The hearing aid also includes a signal processor to process at least one feedback frequency response from the microphone to generate at least one test parameter. This test parameter is used to determine at least one operational characteristic of the microphone. The feedback frequency response of the microphone is generated in response to an acoustic sound (i.e., acoustic feedback sound) that is generated in conjunction with the actuation of the transducer. More specifically, the feedback frequency response generated by the microphone is in response to sound resulting from the actuation of the transducer in response to at least one test signal provided to the transducer.

As set forth in the application, it has been recognized that over time frequency responses generated by hearing aid microphones can change. For instance, in hearing aids having implanted microphones changes in the tissue surrounding the microphone can change the microphone's frequency response to acoustic signals. In this regard, changes to thickness, density and/or compliance of the tissue may occur gradually following the implant of the microphone. Such a process may continue until a steady state is achieved in the surrounding tissue. However, these changes may directly affect the sound received in the microphone and, accordingly, may result in the frequency response of the microphone being altered. In this regard, claim 1 provides a method wherein acoustic feedback sounds resulting from actuation of the transducer may be utilized to determine changes in the operational characteristics of the microphone over time. For instance, acoustic feedback sounds generated in conjunction with actuation of the transducer may be received at first and second times to generate first and second frequency feedback responses for the microphone. Accordingly, if changes have occurred within the tissue surrounding the microphone between the first and second times, changes in the acoustic feedback response of the microphone may be identified. Accordingly, these identified changes may be utilized to compensate the frequency response of the microphone.

In contrast, Leysieffer is directed to a method and apparatus that purports to objectively measure the quality of a coupling between an output transducer and a middle ear or inner ear component. That is, Leysieffer purports to provide a system for determining the quality of a coupling between an output transducer of an implantable hearing aid and a patient's auditory component. After detailed review, Applicant submits that Leysieffer fails to disclose or suggest, inter alia, receiving an acoustic feedback sound at a microphone that is generated by the operation of an implanted transducer. That is, Leysieffer fails to recognize the existence of feedback caused by operation of the transducer let alone generating a feedback frequency response associated with the feedback. Likewise, Leysieffer fails to disclose processing such a feedback frequency response to generate the test parameter or the use such a test parameter to determine an operational characteristic of the microphone. Accordingly, Applicant respectfully requests that this rejection be withdrawn.

Independent claim 15 provides a method for using a hearing aid that allows for compensating for changing characteristics of a microphone in response to an acoustic input. The method includes conducting a test session to determine changes in the frequency response of the microphone and generating at least one test parameter representative of the changes in the frequency responses of the microphone. This test parameter may then be utilized to generate drive signals for a transducer to compensate for changes in the frequency responses of the microphone. For instance, if physiological conditions change between test sessions, the frequency response of the microphones may also change. This change in the frequency responses may then be utilized to generate drive signals for the transducer that compensate for such changes.

Leysieffer fails to disclose or suggest the methodology set forth in claim 15. As noted above, Leysieffer is directed towards determining the coupling quality between a transducer of an implantable hearing aid and a patient's auditory component. Leysieffer does not disclose conducting a test session to determine changes in the frequency response of a microphone and/or generating a test parameter representative of such changes. Accordingly, Leysieffer fails to utilize such a test parameter to generate drive signals for a transducer to compensate for changes in the frequency responses of the microphone. Applicant submits that independent claim 15 is allowable as presented and requests that this rejection be withdrawn.

Independent claim 23 is directed to a hearing aid that allows for generating drive signals that compensate for changed characteristics of a microphone's frequency responses. The hearing aid includes a transducer implantable within a patient to stimulate a component of an auditory system and a microphone to process acoustic sounds and generate frequency responses. The hearing aid further includes a signal processor to process at least one feedback frequency response from the microphone in order to generate drive signals for the transducer that compensate for changed characteristics of the microphone. Again, the feedback frequency response is generated by the microphone in response to an acoustic feedback sound generated in conjunction with the actuation of the transducer in response to at least one test signal. Accordingly, by generating a feedback frequency response and comparing that feedback frequency response to a known value or a previous feedback frequency response, changes in one or more characteristics of the microphone frequency responses may be determined. These changes may then be utilized to generate processed drive signals for the transducer that compensate for changes in the frequency responses of the microphone. Such compensation may prevent a user of the hearing aid from perceiving changes in received sounds.

Again, Leysieffer fails to disclose or suggest the system of claim 23. For instance, Leysieffer fails to, inter alia, generate drive signals that compensate for changed characteristics of a microphone frequency response. This is unsurprising, as Leysieffer discloses no methodology for generating a feedback frequency response caused in conjunction with the actuation of a transducer of an implantable hearing aid system. Accordingly, as Leysieffer fails to generate such a frequency response, Leysieffer cannot identify changes in such a frequency response. Further, Leysieffer cannot utilize such changes to generate processed drive signals for the transducer that compensate for changes in the frequency responses of the microphone. Applicant submits that this rejection should be withdrawn.

The Examiner also rejected claims 11-13, 15-22, 27-33 and 35-42 under 35 U.S.C. §103(a) as being unpatentable in view of Leysieffer. As set forth below, all the claims are believed to be allowable as presented and therefore, this rejection is respectfully traversed. The noted claims include independent claims 15 and 35.

As set forth above, independent claim 15 provides a method for using a hearing aid that allows for compensating for changing characteristics of a microphone in response to an acoustic

input. The method includes, inter alia, conducting a test session to determine changes in the frequency responses of the microphone.

In contrast, Leysieffer provides for determining the coupling quality between a transducer of an implantable hearing aid and a patient's auditory component. In this regard, Leysieffer is directed to an entirely different application than the subject matter of claim 15. Accordingly, it is unclear why one skilled in the art would be motivated by the teachings of Leysieffer to perform the methodology of independent claim 15. Further, it is unclear whether Leysieffer could be modified to perform the methodology of claim 15 as Leysieffer fails to recognize, inter alia, that the frequency response of a microphone may change and/or use of changes in the frequency responses to generate transducer drive signals that compensate for such changes. Accordingly, Applicant submits that independent claim 15 is allowable as presented.

Independent claim 35 is directed to a hearing aid that includes a microphone for processing acoustic sounds and generating frequency responses, a signal processor to process those frequency responses and a transducer to stimulate an auditory component of a patient in response to a transducer drive signal. The processor processes the frequency responses to generate the transducer drive signals. The signal processor further includes a test signal generator to generate and provide a test signal to the transducer and equalization logic to process a feedback frequency response from the microphone that is representative of the test signal and to generate an equalization matrix. Further, the processor includes frequency shaping logic that uses the equalization matrix to process an acoustic frequency response from the microphone in order to generate a processed signal that compensates for change in characteristics of the acoustic frequency response of the microphone.

As noted, Leysieffer provides a method and apparatus for determining the coupling quality between a transducer of an implantable hearing aid and a patient's auditory component. In this regard, Leysieffer is directed to an entirely different application than the subject matter of claim 35. As discussed above, Leysieffer fails to disclose or even suggest the desirability of generating frequency feedback responses of a microphone in response to acoustic feedback sounds generated in conjunction with the actuation of an implanted transducer. Accordingly, it is unclear why one skilled in the art would be motivated by the teachings of Leysieffer to produce the hearing aid of independent claim 35. Accordingly, Applicant submits that this rejection should be withdrawn.

Based upon the foregoing, Applicant believes that all pending claims are in condition for allowance and such disposition is respectfully requested. In the event that a telephone conversation would further prosecution and/or expedite allowance, the Examiner is invited to contact the undersigned.

Respectfully submitted,

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